

STEREO MOC Status Report
Time Period: 2016:249 - 2016:255

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- On day 251, during the DSS-65 support, turbo decoder lock was lost briefly at 1146z and 1245z. This anomaly resulted in the loss of 9 frames of SSR data.
- On day 254, during the DSS-54 support, turbo decoder lock was lost briefly at 1241z. This anomaly resulted in the loss of 7 frames of SSR data.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory operated nominally during this week.

- On day 252, the 91st momentum dump was executed successfully at 1930z, which imparted an estimated delta V of 0.098 m/sec. This was the 10th momentum dump that did not use the IMU. After thruster operations completed, there was a 0.82 degree of roll angle error which was dampened out over the next 7 minutes. Fine pointing stabilized 2.5 minutes after completion of the momentum dump.
- On day 253, the SECCHI instrument reset at 07:31:36z. The SECCHI team reconfigured the instrument to operational mode by 254-2000z. Recovery was delayed as the camera electronics boxes did not come online initially as expected. This was the 40th reset of SECCHI on the Ahead observatory.
- The average daily science data return for Ahead was 5.0 Gbits during this week.

STEREO Behind (STB) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- None.
2. Behind Observatory Status - Low main bus voltage, 2 (#6 & 9) out of 11 battery cells are currently not functioning, attitude uncontrolled, rotating at a ~52 second period about its principal axis of inertia. Current orientation supports some solar array input; RF communications only supports uplink of short commands to an LGA. All propulsion latch valves are closed, propellant frozen, and transducer #2 not functioning. Power switching boards off, all switched loads off, TWTA in standby. EA mode enabled. The battery charge rate is C/10. Detailed status of the recovery activities to restore operations from the Behind loss of communication anomaly, which occurred on October 1, 2014, are listed below. Active recovery operations began with the carrier detection on August 21, 2016.
- On day 249, the reaction wheels came on for 1.3 hours after clearing autonomy rule fire counts in preparation for the autonomous momentum dump. While testing on the hardware simulator did not reveal this, due to very limited telemetry, autonomy rule fire counts were unknown. As a result, the attitude state has once again been perturbed. The uplink is still currently usable; however, the rotation of the spacecraft has increased about the momentum vector such that telemetry lock cannot be maintained long enough for a frame to be received. Only one telemetry packet was received before the attitude was disturbed, a spacecraft currents packet which showed all 4 wheels on at 74 W total. As 41 bad frames were received, telemetry extraction has been requested from the DSN. In preparation for the autonomous momentum dump to re-establish attitude control and Sun pointing, primary external propulsion line and valve heaters were powered on and secondary propulsion tank heaters and secondary propulsion internal line heaters were powered off. Testing of the autonomous momentum dump sequence on the hardware simulator was completed with satisfactory results. The sequence powers on the wheels about a minute before the dump to allow the wheels to soak up some momentum from the body, making that portion of the total system momentum more observable. (The proportion of the momentum in the body is imperfectly observable due to the failed gyro axis.) This approach permits the software to point the spacecraft to the Sun and to dump sufficient momentum to give the star tracker an excellent chance of acquiring a solution expeditiously after the promotion to Standby mode.

- On day 250, during 2 brief TWTA sampling periods this morning, peak carrier signals were -160 dBm dropping carrier lock each cycle with an FDF estimated period of 154 seconds and a spin axis to Earth angle of 41.4 degrees. The DSN radio science receiver team confirmed that the downlink rate is 35 bps indicating the battery bus voltage did not collapse during the night. The uplink is still currently usable for short command lengths; however, a longer duration is necessary to load the updated macro for conducting the autonomous momentum dump. A test macro of the same length containing only the TWTA on/off commands was tested, but did not load successfully. Telemetry lock could not be maintained long enough for a frame to be received. As 30 bad frames were received, telemetry extraction has been requested from the DSN. In preparation for the autonomous momentum dump to re-establish attitude control and Sun pointing, primary external propulsion line and valve heaters, primary propulsion tank heaters, and primary propulsion internal line heaters remain on.
- On day 251, telemetry was received again for 8 minutes out of 14 minutes during 5 brief TWTA sampling periods, peak carrier signals were -158 dBm, dropping carrier lock for 6 minutes. As battery pressure is quite good, battery temperature was high (33 deg C) and some propulsion lines are still cold, two additional heaters were powered on: secondary propulsion line internal heaters and TWTA replacement heater to ensure all propulsion lines and components are warmed. As the battery is degraded (2 out of 11 cells not functioning), to monitor battery performance with 5 heaters on to thaw the hydrazine, a 6 hour DSS-43 support was added starting at 2100z. Later, after evaluating the latest telemetry, the propulsion lines were warm except the A2 and A3 thrusters which will not be used in EA mode. All subsystems were polled and GSFC made the decision to proceed. All heaters were powered off and the command to execute the sequence for the autonomous momentum in EA mode as sent at 2316z. At 0004z, carrier lock was received from the HGA at a -155 dBm peak signal with modulation for ~1 minute, and then faded. The radio science receiver team confirmed the expected 633 bps downlink rate. Carrier lock was again received at 0110z at a -162 dBm peak signal for ~1 minute, and then faded. As expected, at 0158z, carrier lock was received on the -Z LGA at -162 dBm, however, then slowly dropped after 8 minutes. At 0225z, a stable carrier lock was received at -157 dBm,

however, after 10 minutes it began to decrease. At 0239z, the first telemetry frame was received. System momentum was high at 22.5 Nms, battery pressure was 510 psi and decreasing, main bus volt was 21.7v with the main bus current at 18.5A. As system momentum was high, commanded a momentum dump. As battery pressure was dropping, commanded the TWTA and operational and survival heaters off. At 0330z, the sweep did not work; the uplink was re-swept and sent all commands again. As the TWTA powered off on this time, it is assumed the subsequent momentum dump command executed. A total of 6 telemetry frames were received. Telemetry extraction was requested from the DSN.

- On day 252, two ~1 minute carrier locks at a peak signal level of -176 dBm were received this morning from commanding the TWTA on. As the momentum dump in EA mode was not as effective as we had hoped, from only 6 housekeeping packets that were received yesterday after promoting to C&DH standby mode, system momentum remains high causing instability with attitude control. Commands were sent repeatedly today to conduct an autonomous momentum dump and to power off 14 operational heaters to preserve battery state of charge. Before the next track tomorrow, the soft command timer will expire resulting in switching to the +Z LGA, powering on the TWTA and rotate, if wheels allow, at 5 degrees/minute.
- On day 253, while the spacecraft was configured for switching to the +Z LGA and powering on the TWTA before the track this morning, no signal was received today after repeatedly attempting to power on the TWTA. As the spacecraft rotation will settle out about its principal axis of inertia which should continue to provide limited solar array input and communications, battery state of charge recovery has commenced today. As it appears that the momentum dump in EA mode was not as effective as we had hoped for during the Behind recovery into C&DH standby mode late day 251, it is suspected that battery voltage collapsed on day 252 due to sustained high wheel speeds. The 2nd spacecraft emergency ended at 253-0000z.
- On day 254, once again the carrier was detected by the DSN this morning. During 3 brief TWTA sampling periods, the carrier signal had a lower peak signal of -166 dBm and a period of ~60 seconds continuously. Subcarrier lock did not occur. While the uplink can support short critical commands, the downlink cannot support telemetry. The

spacecraft was configured for a low power mode by powering off all power switching boards and loads. EA mode was enforced as to prevent the use of the HGA in C&DH standby mode.

- On day 255, during 2 brief TWTA sampling periods, the carrier signal was similar to yesterdays with a continuously fluctuating signal of -166 dBm to -180 dB. From the FDF Doppler analysis, the period is now ~52 seconds, and has increased 3 seconds over the last 30 hours. Subcarrier lock did not occur. While the uplink can support short critical commands, the downlink cannot support telemetry. The spacecraft was configured for a low power mode by powering off all power switching boards and loads. EA mode was enforced as to prevent the use of the HGA in C&DH standby mode.